






## Laserpuncture Shooting Duration Effect at the Growth Point on the Weight Gain and Growth Rate of Male Japanese quail (*Coturnix coturnix japonica*)

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### ABSTRACT

The aim of this research is to find the effect of laserpuncture shooting at growth points on body weight gain and growth rate of male Japanese quail. This research used 20 samples of Japanese male Day Old Quail (DOQ) with a complete randomized design research method. These samples were divided into four groups. Group P0 (control) was treated by laserpuncture every day with the power supply off for 5 seconds. Group P1 was treated by laserpuncture every day with power supply at 50 mWatt and the dose was 0.2 Joule for 5 seconds. Group P2 was treated by laserpuncture every three days with power supply at 50 mWatt and the dose was 0.2 Joule for 5 seconds. Group P3 was treated by laserpuncture every five days with power supply at 50 mWatt and the dose was 0.2 Joule for 5 seconds. The samples were reared until 42 days. The results of the research were obtained from weighing the body weight every week and then subtracting the results from the previous week. The data was analyzed statistically using the Multivariate Analysis of Variance (Manova) and continued with the Duncan test. Statistical comparison between P0, P1, P2, and P3 showed that there were significant differences in both body weight gain and growth rate ( $p < 0.05$ ). Group P3 showed the best results compared to other groups.

**Keywords:** Laserpuncture, male Japanese quail, weight gain, growth rate

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### Introduction

Quail (*Coturnix coturnix*) is one of the poultry commodities that is starting to become popular among Indonesian people. Quail cultivation is considered a promising business considering the high market demand. Java Island, especially East Java Province, has experienced a significant increase in the quail population. In 2017, there were 3,682,453 quail recorded, and this will continue to increase to 4,979,565 in 2021. However, despite this, most farms in Indonesia only breed female quail. Female quail are chosen to be bred with the aim of being egg-laying producers and can also be used as meat producers after they grow old or are rejected (Akarikiya et al., 2023).

This has a direct impact on the economic value of male quail, especially when the Day Old Quail (DOQ) is very low. DOQ males are generally considered waste from the livestock industry, so they are used as feed for predatory animals, and only a small part is used as males for hatching eggs (Wianto and Duhita, 2022). Raising quail has several advantages, such as easy maintenance, faster sexual maturity, and the ability not to use large areas of land (Nasar et al., 2016). Quail can also be a source of diversification for meat and egg products.

The quail that is widely used as livestock as a producer of both layers and meat is the Japanese quail (*Coturnix coturnix japonica*). Japanese quail have a meat texture that resembles chicken meat, relatively high egg production, a relatively short generation interval, and a relatively fast incubation period (Purohit et al., 2016).

It is hoped that the cultivation and use of male Japanese quail (*Coturnix coturnix japonica*) can be a solution to increase their economic value. The use of male Japanese quail as meat-producing livestock certainly still requires efforts to increase productivity. Various methods can be used to improve the productivity of male Japanese quail (Nasrollah, 2008). Laserpuncture technology that is applied appropriately can be an option. Increasing the productivity of male Japanese quail can be done by increasing their growth rate. This increase in growth rate is closely related to the weight gain of the quail. Various variations ranging from improving management and feed quality, environmental management, and even the use of technology can be carried out to achieve significant weight gain so that the growth rate of male quail increases to the maximum.

The technology in the world of veterinary medicine that can be utilized is laserpuncture technology. Laserpuncture is a technology that works by shooting lasers at acupuncture points to increase animal productivity (Warsito et al., 2021). Laser shooting at livestock can be used to manipulate livestock biological processes. This laser shooting can increase livestock weight gain, as well as increase livestock reproductive ability. Lasers are fired at acupuncture points or receptors on the surface of the livestock's body (Yang et al., 2021). Nisa et al. (2020), stated that laserpuncture as a technology uses a method of stimulating acupuncture points with a laser as a stimulator. This stimulating effect will have a real effect if fired directly at the acupuncture points. Acupuncture points are receptors that have "high potential and low resistance" electrical properties, so they can produce energy and then transmit the energy until it reaches the target organ.

It is estimated that weight gain and the increase in the growth rate of poultry, including male Japanese quail, can be achieved by stimulating acupuncture points, namely the growth points. Warsito et al. (2021), growth points in poultry consist of three acupuncture points, namely, Hu Men point (stomach point), Bei Ji point (heart and lung point), and Gou Hou point (hormonal point). Based on the background

above, it is necessary to carry out research to determine the effect of laser-puncture shooting on weight gain and the growth rate of male quail.

## Materials and methods

### Research design

This research was carried out at the Experimental Animal Cage, Faculty of Veterinary Medicine, Airlangga University from January – March 2023. The research design carried out in this study was a Completely Randomized Design (CRD) with four treatments, each carried out five times, so that 20 animals were needed. DOQ. The four treatments are P0: the control group was treated with laserpuncture with the device off or the equivalent of 0 Joules every day; P1: treatment group with 0.2 Joule semiconductor laserpuncture firing every day; P2: treatment group with 0.2 Joule semiconductor laserpuncture firing every 3 days; P3: treatment group with semiconductor laserpuncture firing at 0.2 Joules every 5 days.

### Preparatory procedures

During the 7-day adaptation period, DOQ was placed in the broodstock cage and given the ND vaccine to prevent contracting the disease. Next, after the adaptation period, a cage measuring 32 cm long, 43 cm wide, and 14 cm high is prepared and then disinfected. The cage is also equipped with a heater in the form of a 5-watt bulb and paper mats. Next, the DOQ was divided into 4 equal groups by dividing the cages using cardboard and weighing the DOQ for initial data before being given treatment. Feed and drink are provided continuously or ad libitum with reference to the amount of feed given based on age (Table 1).

**Table 1.** Amount of quail feed per day according to age

Quail lifespan	Rations g/head/day
2 - 7 days (first week)	3.6
8 - 14 days (second week)	6.8
15 - 21 days (third week)	8.9
22 - 35 days (fourth week)	10.8
35 - 42 days (fifth week)	15.0
Next age	20.0

### Treatment procedures

The quail are handled so they don't move, then a laser is fired at the growth point. Shooting is carried out at the Hu Men/ST-4 point which is located at the

corner of the beak caudo-ventral to the corner of the mouth, the Bei Ji/HT-1, BL-13, BL-15 points which are located at the base next to the axillary apex fossa and the Gou Hou point (BL-64) which is located on the posterior leg (plantar side of the tarsometatarsal joint). Shooting was carried out once at each point and carried out on the dexter and sinister sides of the quail's body. This treatment was carried out on all members of P0 with the equipment off and on all members of P1, P2, and P3 with a dose of 0.2 Joules. The treatment interval for P0 and P1 is every day, P2 every 3 days, and P3 every five days. Treatment begins when the quail is 1 week to 7 weeks old.

### Data analysis

The data obtained was then analyzed using Manova (Multivariate Analysis of Variance). Measurement data is presented in the form of a description. If between treatments shows a significant difference ( $p < 0.05$ ), a further test will be carried out using the Duncan Test. The data analysis then used IBM SPSS Statistics 25.

## Result

### Weight gain

Table 2 shows the average and standard deviation of body weight gain of male Japanese quail per week.

**Table 2.** Mean and standard deviation of weight gain in male Japanese quail

Treatment	n	Quail Weight Gain (g)						
		1st week	2nd week	3rd week	4th week	5th week	6th week	7th week
P0 (Control)	5	7.96 <sup>a</sup> ± 0.56	12.50 <sup>a</sup> ± 2.09	19.56 <sup>a</sup> ± 2.09	28.32 <sup>a</sup> ± 0.71	28.88 <sup>a</sup> ± 2.08	-4.40 <sup>c</sup> ± 0.58	20.92 ± 1.52
P1 (1 day)	5	13.84 <sup>b</sup> ± 1.34	11.26 <sup>a</sup> ± 1.89	29.60 <sup>b</sup> ± 2.50	27.54 <sup>a</sup> ± 6.20	34.12 <sup>b</sup> ± 6.05	-23.38 <sup>a</sup> ± 8.70	20.28 ± 4.71
P2 (3 days)	5	15.10 <sup>c</sup> ± 0.78	11.36 <sup>a</sup> ± 1.12	20.92 <sup>a</sup> ± 0.91	31.20 <sup>a</sup> ± 1.21	31.64 <sup>ab</sup> ± 1.55	- 15.50 <sup>b</sup> ± 0.79	16.54 ± 0.77
P3 (5 days)	5	13.36 <sup>b</sup> ± 0.60	15.52 <sup>b</sup> ± 0.44	20.80 <sup>a</sup> ± 0.44	28.16 <sup>a</sup> ± 0.68	33.40 <sup>ab</sup> ± 0.81	- 19.22 <sup>ab</sup> ± 1.29	20.04 ± 0.21

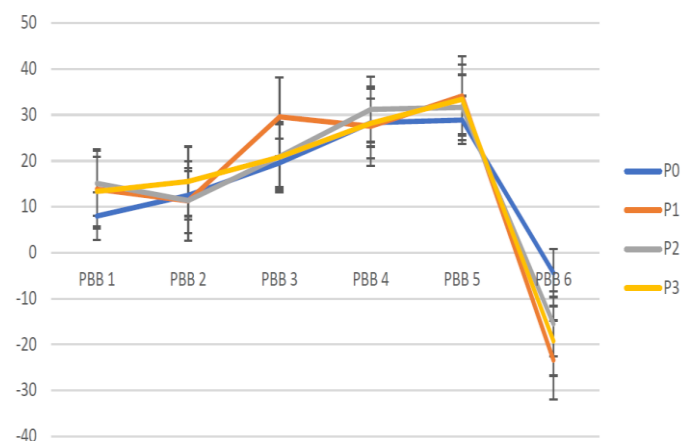
Note: Different superscripts in the same column indicate significantly different results ( $p < 0.05$ )

The results of the Manova analysis (Multivariate Analysis of Variance) followed by the Duncan test in Appendix 3 showed that the weight gain of 1 group P0 ( $7.96 \pm 0.56$ ) was significantly different ( $p < 0.05$ ) from groups P1, P2, and P3. Group P2 ( $15.10 \pm 0.78$ ) was significantly different ( $p < 0.05$ ) from groups P0, P1, and P3. Groups P1 and P3 were ( $13.84 \pm 1.34$ ) and ( $13.36 \pm 0.60$ ) not significantly different ( $p > 0.05$ ).

Weight gain 2, groups P0, P1, and P2 were ( $12.50 \pm 2.09$ ), ( $11.26 \pm 1.89$ ), and ( $11.36 \pm 1.12$ ) not significantly different ( $p > 0.05$ ). Group P3 ( $15.52 \pm$

$0.44$ ) was significantly different ( $p < 0.05$ ) from P0, P1, and P2. Weight gain 3, group P1 ( $29.60 \pm 2.50$ ) was significantly different ( $p < 0.05$ ) from groups P0, P2, and P3. Groups P0, P2, and P3 were ( $19.56 \pm 2.09$ ), ( $20.92 \pm 0.91$ ), ( $20.80 \pm 0.44$ ) not significantly different ( $p > 0.05$ ). Weight gain 4 showed results that were not significantly different because  $p > 0.05$ . Weight gain 5, group P0 ( $28.88 \pm 2.08$ ) was significantly different ( $p < 0.05$ ) to P1 ( $34.12 \pm 6.05$ ), Groups P2 and P3 were ( $31.64 \pm 1.55$ ) and ( $33.40 \pm 0.81$ ) were not significantly different ( $p > 0.05$ ) from the P0 and P1 groups.

Week 6 experienced significant weight loss. The results of the analysis showed that this weight loss was significantly different between treatment groups. Group P0 ( $-4.40 \pm 0.58$ ) was significantly different ( $p < 0.05$ ) from groups P1, P2, and P3. Group P1 ( $-23.38 \pm 8.70$ ) was significantly different ( $p < 0.05$ ) from P2. Group P3 ( $-19.22 \pm 1.29$ ) was not significantly different ( $p > 0.05$ ) from groups P1 and P2. A comparison of the average weight gain of male Japanese quail across groups can be seen in Figure 1.



**Figure 1.** Diagram of weight gain for male Japanese quail

### Growth rate

Table 3 shows the average and standard deviation of body weight of male Japanese quail each week. The Duncan test followed the Manova analysis results (Multivariate Analysis of Variance). It was seen that laserpuncture firing in the first week of groups P0 ( $16.62 \pm 0.42$ ) and P2 ( $16.28 \pm 0.22$ ) was significantly different ( $p < 0.05$ ) compared to groups P1 and P3.

The second week, group P0 ( $24.58 \pm 0.38$ ) was significantly different ( $p < 0.05$ ) from groups P1, P2, P3. Treatment groups P1, P2, and P3 were ( $31.24 \pm 1.39$ ), ( $31.38 \pm 0.72$ ), ( $31.16 \pm 0.42$ ) and were not significantly different ( $p > 0.05$ ). The third week, group P0 ( $37.08 \pm 2.33$ ) was significantly different ( $p < 0.05$ ) from groups P1, P2, and P3. Group P1 ( $42.50 \pm 1.97$ )

was not significantly different ( $p>0.05$ ) from group P2. Group P3 ( $46.68 \pm 0.38$ ) was significantly different ( $p<0.05$ ) from groups P0, P1, and P2.

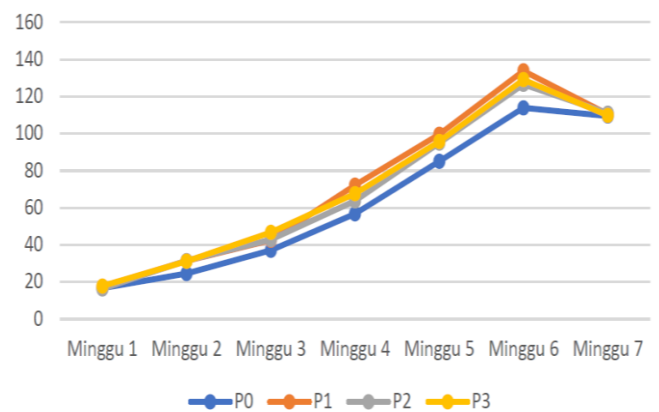
In the fourth week, the P0 group ( $56.64 \pm 0.46$ ) was significantly different ( $p<0.05$ ) from the P1, P2, and P3 groups. Group P1 ( $72.10 \pm 1.25$ ) was significantly different ( $p<0.05$ ) from groups P0, P2, and P3. Group P2 ( $63.66 \pm 0.65$ ) was significantly different ( $p<0.05$ ) from groups P0,

**Table 3.** Mean and standard deviation of the growth rate of male Japanese quail

Treatment	n	Quail Weight Gain (g)							Total
		1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	
P0 (Control)	5	16.62 <sup>a</sup>	24.58 <sup>a</sup>	37.08 <sup>a</sup>	56.64 <sup>a</sup>	84.96 <sup>a</sup>	113.84 <sup>a</sup>	109.44 <sup>a</sup>	92.82
		$\pm 0.4$	$\pm 0.3$	$\pm 2.3$	$\pm 0.4$	$\pm 0.5$	$\pm 1.83$	$\pm 2.37$	$\pm 1.95$
		2	8	3	6	2			
P1 (1 day)	5	17.40 <sup>b</sup>	31.24 <sup>b</sup>	42.50 <sup>b</sup>	72.10 <sup>d</sup>	99.64 <sup>c</sup>	133.76 <sup>c</sup>	110.38 <sup>a</sup>	92.98
		$\pm 0.3$	$\pm 1.3$	$\pm 1.9$	$\pm 1.2$	$\pm 5.2$	$\pm 5.44$	$\pm 4.09$	$\pm 3.77$
		2	9	7	5	3			
P2 (3 days)	5	16.28 <sup>a</sup>	31.38 <sup>b</sup>	42.74 <sup>b</sup>	63.66 <sup>b</sup>	94.86 <sup>b</sup>	126.50 <sup>b</sup>	111.00 <sup>a</sup>	94.72
		$\pm 0.2$	$\pm 0.7$	$\pm 0.4$	$\pm 0.6$	$\pm 0.9$	$\pm 0.85$	$\pm 0.80$	$\pm 0.58$
		2	2	3	5	7			
P3 (5 days)	5	17.80 <sup>b</sup>	31.16 <sup>b</sup>	46.68 <sup>c</sup>	67.48 <sup>c</sup>	95.64 <sup>b</sup>	129.04 <sup>b</sup>	109.82 <sup>a</sup>	92.02
		$\pm 0.2$	$\pm 0.4$	$\pm 0.3$	$\pm 0.4$	$\pm 0.3$	$\pm 0.62$	$\pm 1.07$	$\pm 0.81$
		6	2	8	4	7			

Note: Different superscripts in the same column indicate significantly different results ( $p<0.05$ )

In the sixth week, the P0 group ( $113.84 \pm 1.83$ ) was significantly different ( $p<0.05$ ) from the P1, P2, and P3 groups. Group P1 ( $133.76 \pm 5.44$ ) was significantly different ( $p<0.05$ ) from groups P0, P2, and P3. Group P2 ( $126.50 \pm 0.85$ ) was not significantly different ( $p>0.05$ ) from group P3. The seventh week showed that the analysis results were not significantly different because  $p>0.05$ . A graph of the average growth rate of male Japanese quail for all groups can be seen in Figure 2.



**Figure 2.** Graph of the growth rate of male Japanese quail

## Discussion

### Weight gain

The main goal of breeders in managing their livestock is to achieve high production rates. One of the production figures for broiler livestock is the amount of weight gain of the livestock. This weight gain can occur due to the increase in muscle mass, bones, and body organs of livestock. The results of research using semiconductor laserpuncture showed that laserpuncture was proven to have an effect on weight gain in quail. Shooting laserpuncture every day with a dose of 0.2 Joules produces the greatest weight gain in week 3. However, shooting laserpuncture every 3 days with a dose of 0.2 Joules is considered to be the best result because it produces a stable weight gain that always increases and more efficient. This opinion is supported by the opinion of Qomar *et al.* (2017) who states that semiconductor laserpuncture firing with the aim of growth and meat production can be carried out with a firing interval of five days. Another opinion that is also in line is Bishop *et al.* (2021), who stated that muscle formation in birds occurs in four to six days.

Other factors can also influence quail weight gain. Stressors from handling and weather during treatment are assumed to be one of the strongest influences on quail growth. This is in accordance with the opinion of Fauzan *et al.* (2018), who said several other factors influence quail growth, such as genetics, gender, hormones, feed, environment, and management.

### Growth rate

Growth rate is one of the points that breeders pay attention to and take into account in order to achieve maximum results of broiler quail. The faster the growth rate of the quail, the shorter the maintenance period, so the production costs incurred by the farmer will be minimal. On the other hand, the



longer the growth rate, the longer the maintenance period, and the greater the production costs incurred by the farmer, so the slow growth rate of quail is something that is detrimental to quail farmers. The growth rate is generally seen from the increase in the body weight of livestock per certain time (Kassahun *et al.*, 2022).

The research results also showed that laserpuncture affected the growth rate of quail. Shooting laserpuncture every day, 3 days and 5 days with a dose of 0.2 Joules resulted in a higher growth rate of quail compared to shooting laserpuncture with the equipment off or the equivalent dose of 0 Joules. This is thought to be because the treatment group experienced improvements in the body's digestive system resulting in optimal conditions.

Analysis using Manova followed by the Duncan test showed that the means and standard deviations were significantly different. In the first week to the sixth week, the P1, P2, and P3 treatment groups experienced higher growth rates than the P0 control group. Meanwhile, in the seventh week, there were no significant differences between the P0 control group and the P1, P2, and P3 treatment groups. This result is assumed to occur because the bird's growth in the sixth week begins to stabilize. In the seventh week there is a decrease in body weight so it can be proven that the growth inflection point for quail is at the age of six weeks. This is supported by Solano-Blanco *et al.* (2023); after the sixth week, the bird's growth begins to stabilize and tends to decrease because bone growth has reached its maximum size.

### **Mechanisms and effects of laserpuncture**

Laserpuncture, as a technology adapted from traditional Chinese medicine acupuncture, is able to provide stimulation and effects similar to the use of needles in traditional acupuncture. Warsito *et al.* (2021) stated that the mechanism of laserpuncture is shooting a laser at acupuncture points, which will then respond with the emergence of energy. The energy is then channeled to the target organs through meridian pathways. The target organs will receive this energy and will experience physiological and biochemical changes. Meridian pathways as a bridge for energy from acupuncture points to target organs have been proven by research by Maurer *et al.* (2019) by injecting Technitium99 into acupuncture points and not acupuncture points.

Manente *et al.* (2023) stated that acupuncture points have a high level of sensitivity to stimulation, so if laserpuncture is fired at the acupuncture points, it can cause molecular messages, which then propagate

through the cellular system to the target organs. This molecular message enters the cell and influences protein synthesis from the cell so that it can form an enzyme. The enzymes produced by cells can then increase the productivity of body tissues or organs, resulting in an increase in growth rate. This is in line with the results of research on laser puncture shooting which has an effect on the growth rate of quail.

Growth points in poultry include the Hu Men, Bei Ji, and Gou Hou points. Stimulation at these points can improve livestock production performance (Warsito *et al.*, 2021). Liang *et al.* (2015) stated that the energy arising from the stimulation of acupuncture points will balance the Yin and Yang of the target organs so that physiological and biochemical changes occur. These changes are part of the homeostatic mechanism that optimizes organ performance. Some points can produce dual regulatory effects to achieve optimal organ performance, for example, the BL-21 point, which can increase or suppress gastrointestinal motility according to the needs of the body's condition (Wang *et al.*, 2015).

Laserpuncture shooting at the Hu Men point can increase livestock appetite through hunger (Warsito *et al.*, 2021). Hunger occurs when the stomach and intestines are empty. Gastric and intestinal emptying can occur more quickly if there is an increase in gastrointestinal motility in the form of relaxation of the pyloric sphincter and peristaltic movements (Lu *et al.*, 2018). This also affects the process of better food absorption. The Hu Men point is able to activate the vagus nervous system which has an important role in gastrointestinal motility. Another variable in the same study proved that laserpuncture shooting at the Hu Men point was able to increase the weight of the jejunum and the width of the jejunal villi. The highest absorption process is known to occur in the Jejunum (Kusuma *et al.*, 2019).

The Bei Ji point is related to the heart and lungs. Shooting laserpuncture at this point activates the sympathetic nerves, which results in increased oxygen diffusion in the alveoli so that more oxygen is carried by the bloodstream and distributed throughout the body. This increase in oxygen diffusion can occur due to bronchodilation, which allows more air to enter the lungs. Nurwati *et al.* (2019) suggested that laserpuncture firing can activate the sympathetic nerves which causes bronchodilation. Apart from being able to increase oxygen consumption, firing at the Bei Ji point can increase blood flow throughout the body. This increase in blood flow is closely related to an increase in heart rate. Stimulation of the Bei Ji point

is able to activate the sympathetic nervous system in stimulating the sinoatrial node and atrioventricular node to increase heart rate and myocardial contractility (Gordan *et al.*, 2015).

Increased blood flow results in an increase in cardiac output which plays a direct role in meeting oxygen needs in cells. Oxygen is a very important fuel in the cellular respiration mechanism of mitochondria that produces ATP. Shooting at the Gou Hou point has an effect on increasing growth through the hormonal system. The hypothalamus will be stimulated to secrete growth hormone-releasing hormone (GHRH), which in turn results in stimulation of the anterior pituitary to secrete growth hormone. Furthermore, growth hormone has the ability to break down fat reserves and stimulate the liver to break down glycogen into glucose and the secretion of insulin-like growth factor-1 (IGF-1). Lu *et al.* (2019) stated that IGF-1 has the function of stimulating growth in muscle cells, bone cells, and immune cells.

## Conclusion

Based on the results of research that has been carried out, it can be concluded that the duration of laserpuncture shooting at the growth point can increase the body weight gain of male Japanese quail and the duration of laserpuncture shooting at the growth point can increase the growth rate of male Japanese quail.

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